

SURVIVAL OF RELEASED REHABILITATED BALD EAGLES

Final Report

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INTRODUCTION

The rehabilitation and release of injured wildlife has become a widespread occurrence over much of North America with over 2500 permitted wildlife rehabilitators in the United States (E.Thrune Natl. Wild. Rehabilitators Assoc. pers. comm.). While exact figures are not available it can be assumed that many of these permittees handle birds of prey. One of the underlying assumptions of raptor rehabilitation is that a released bird survives and resumes "normal" activities. Most importantly, it is assumed, these birds become part of the breeding population, thus contributing to the conservation of their species (Fraser and Moss 1985).

Unfortunately, very little effort has been made to document the survival, or breeding rates, of released rehabilitated raptors. This information is critical when assessing the value of rehabilitation to the conservation of populations (Fraser and Moss 1985). Duke, et al. (1981) documented nesting by 2 released rehabilitated Bald Eagles (Haliaeetus leucocephalus) 1 and 2 years respectively after their release. They also reported on band returns and incidental sightings of other raptors released from the University of Minnesota. Servheen and English (1979), reported on the movements of color-marked rehabilitated Bald Eagles in the Pacific Northwest. Radiotelemetry was used by Hamilton et al. (1988) to monitor the survival of eight Red-tailed Hawks (Buteo jamaicensis) and one Red-shouldered Hawk (Buteo lineatus) in Louisiana.

Our study was designed to monitor the survival, movements, and breeding attempts of Bald Eagles released from The Raptor Center at the University of Minnesota (TRC). Since 1974 TRC has treated over 630 Bald Eagles for a variety of ailments including fractures, soft tissue injuries, poisoning, and disease. Over 50% of the eagles admitted to the Center have been released to the wild.

METHODS

Nineteen Bald Eagles admitted to TRC with injuries that included wing fractures, starvation, and toe and foot damage from leg hold traps (Table 1) were selected for use in this study. Injuries were repaired and the birds determined ready for release using standard TRC rehabilitation techniques described elsewhere (Redig et al. 1983, Martell and Redig 1985, Chaplin et al. 1989, Chaplin 1989). The amount of time each bird spent in treatment at TRC varied widely, from 23 to 522 days (mean = 139.7, n=19) and was related to the nature of the injury. Fourteen birds were sexed using morphometric measurements (Garcelon et al. 1985), and all birds were aged using plumage characteristics (predominantly white head and tail = adult,). Each bird admitted to TRC was given a unique case number and the eagles are referred to in this report by that number.

TABLE 1

CASE HISTORY OF RELEASED BALD EAGLES

Case Number	Age	Sex	Cause of Injury	Type of Injury/Treatment	Time in Clinic (Days)
N-370	Ad	M	tp	Toe	23
N-374	Ad	F	tp	Halux/ Amputation	38
N-415	Asy	F	tp	Toe/ Amputation	25
N-408	Ad	F	tp	Toe/ Amputation	30
N-390	Asy	U	tp	Halux/ Amputation	42
N-263	Hy	M	cv	Starvation	122
N-369	Hy	U	pr	Wing Fracture (Ulna)	90
O-002	Ad	M	tp	Toe/ Amputation	40
M-209	Sy	U	mt	Wing Soft Tissue Inj.	522
O-103	Asy	F	mt	Unable to fly	184
O-430	Sy	M	pr	Wing Fracture (Ulna)	55
O-335	Sy	U	mt	Starvation	498
P-353	Ad	F	mt	Wing Fracture (Ulna)	132
P-271	Ad	F	mt	Unable to fly	139

TABLE 1 (Cont.)

CASE HISTORY OF RELEASED BALD EAGLES

Case Number	Age	Sex	Cause of Injury	Type of Injury/Treatment	Time in Clinic (Days)
O-414	Hy	U	pr	Wing Fracture (Ulna)	420
P-439	Hy	F	mt	Wing Fracture (Ulna)	51
P-412	Sy	F	pr	Wing Fracture (Humerus)	85
P-452	Sy	M	pr	Wing Fracture (Ulna)	79
P-506	Hy	U	mt	Coracoid Fracture	79

Hy = Hatch Year Sy = Second Year,

Asy = After Second Year Immature, Ad = Adult

Injury - tp = leg hold trap injury, pr = projectile injury,

mt = miscellaneous trauma cv = collision with vehicle

Eagles were released between November and February, 1987 - 1990 (Table 2). Twelve eagles were released at the Carpenter St. Croix Valley Nature Center (CNC) on the St. Croix River 2 miles north of the confluence of the Mississippi and St. Croix Rivers (Fig. 2). Six birds were released at Pigs Eye Island (PEI) located on the Mississippi River south of Holman Airfield in St. Paul, MN at river mile (rm) 834 (Fig. 1). One bird was sent back to its point of recovery in Michigan. Both the PEI and CNC locations are regular winter TRC Bald Eagle release sites.

All eagles released in this study were marked with a standard U.S. Fish and Wildlife Service aluminum leg band. Nine of the birds were fitted with white wrap-around patagial markers (Young and Kochert 1987). Each marker was alpha-numerically coded with orange herculite sown onto the dorsal and ventral side of the marker.

Each eagle was also fitted with a radio-telemetry transmitter. Ten birds (N-370, N-374, N-415, N-408, N-390, N-263, N-369, O-002, M-209, O-430) were fitted with a tail mounted transmitter operating in the frequency range between 164.010 and 164.250 (Advanced Telemetry Systems; Bethel, MN) with an expected battery life of 120 days. The radio was attached to a central rectrix by tightening a clamp around the base of the feather shaft. The 8 in. antenna was secured to the feather with surgical thread. Both the radio and the antenna were also secured with epoxy glue. The total package weighed approximately 20 grams.

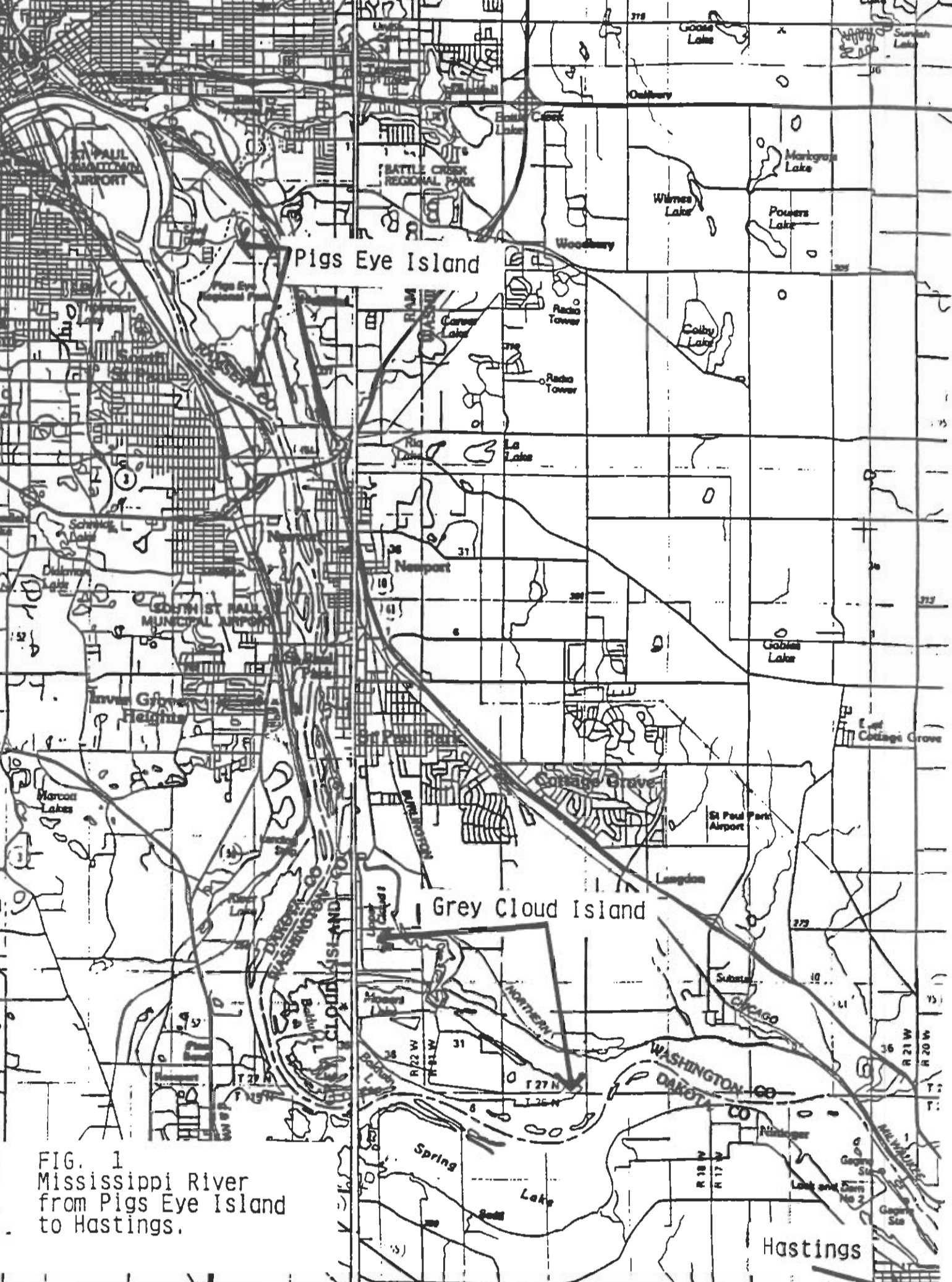
TABLE 2.

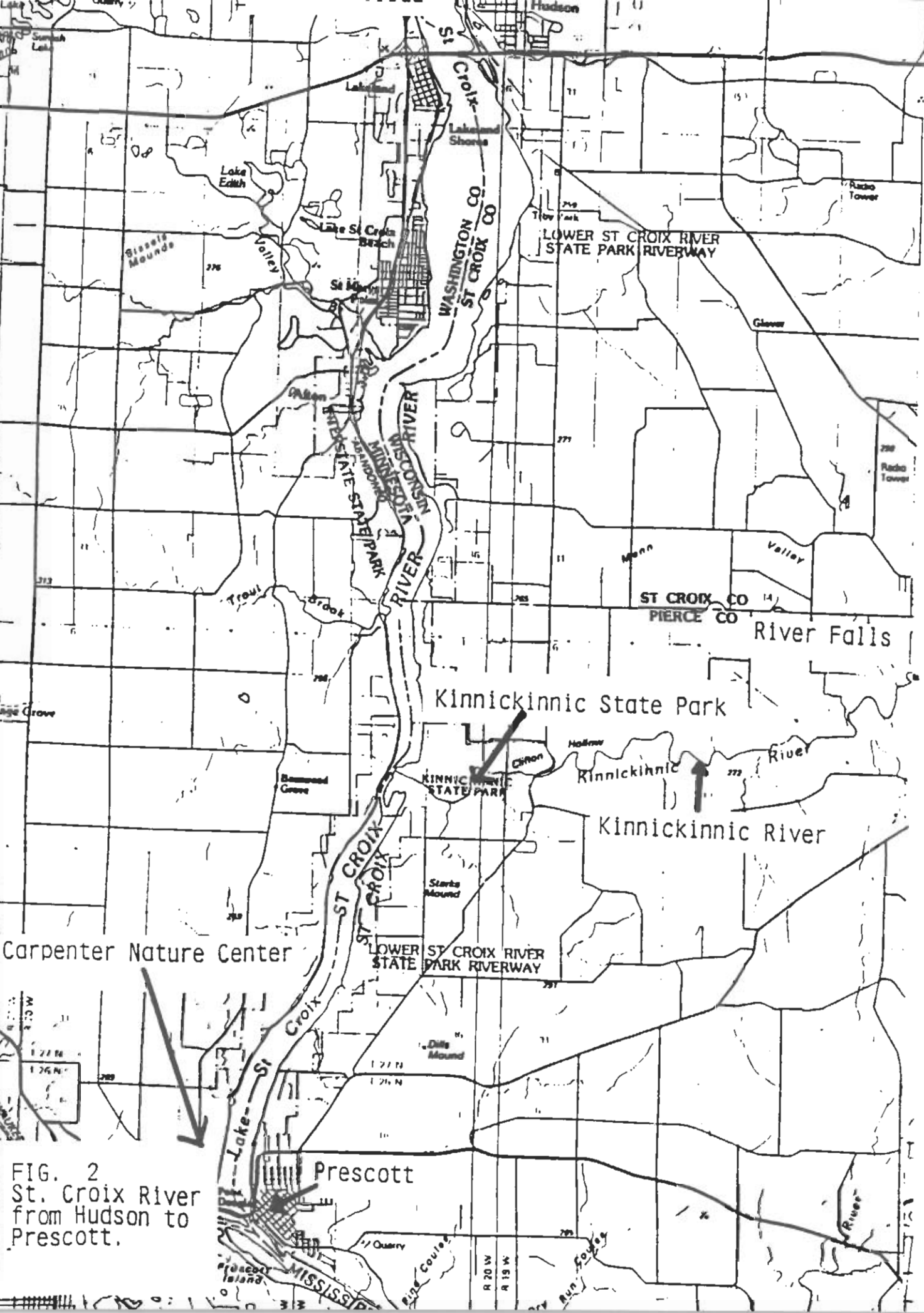
RELEASE INFORMATION ON REHABILITATED BALD EAGLES

Case Number	Pat. Marker	Release Site	Release Date	# Days Tracked	Max. Dist. Travelled (km)
N-370	----	CNC	11/22/87	126	30
N-374	----	CNC	12/06/87	80	500
N-415	R 7-6	PEI	12/15/87	854	---
N-408	R 7-5	PEI	12/15/87	71	---
N-390	L 7-7	PEI	12/18/87	67	610
N-263	L 7-8	CNC	12/20/87	2	---
N-369	R 8-1	PEI	01/25/88	52	16
O-002	L 8-4	PEI	02/12/88	6	16
M-209	R 8-3	PEI	02/12/88	66	---
O-103	---	CNC	11/08/88	29	129.6
O-430	L 8-9	CNC	12/11/88	1	25.6
O-335	---	CNC	11/06/89	172	40
P-353	9-49	CNC	11/08/89	63	10.4
P-271	---	MI	12/01/89	---	---
O-414	---	CNC	12/05/89	143	53
P-439	---	CNC	12/11/89	102	12
P-412	---	CNC	01/05/90	111	21
P-452	---	CNC	01/17/90	48	19
P-506	---	CNC	02/12/90	29	55

Patagial Marker - R = right wing, L = left wing

Release Site - CNC = Carpenter Nature Center, PEI = Pigs Eye Island
MI = Michigan





Nine birds (O-103, O-335, P-353, P-271, O-414, P-439, P-412, P-452, P-506) were fitted with a back-pack mounted transmitter (Communication Specialists, Orange Calif.) with an expected battery life of 3 years. The radio was attached by means of a teflon ribbon running over the bird's shoulders and under its wings (Kenward 1987). The antenna hung loose down the bird's back. The total package weighed 90 grams.

Radio signals were located from the ground and from a fixed wing aircraft. The study was begun using a Model CE 12 portable receiver (Custom Electronics, Urbana, Ill.) with a 3 element collapsable yagi antenna. This was later supplemented with 2 Cedar Creek Model 2000 programmable scanning receivers with 4 element yagi antennas. Air tracking was done utilizing the scanning receiver connected via a switch box to 2, 4 element yagi antennas affixed to the wing strut of a Cessna 152 or 172 aircraft (Gilmer et al. 1981).

Daily radio triangulations were attempted on each bird for the first 10 days following its release and then at least once a week after that for as long as the bird remained north of the MN-Iowa border. Weekly flights along the Mississippi River were flown from November through March of each year to census wintering Bald Eagles and to locate radio tagged eagles. Additonal flights to locate birds were made as follows:

12/14/87 - Anoka, MN to Stillwater, MN to Redwing, MN (fig 4)

01/21/88 - Central and Western Minnesota (Fig 4)

02/23/88 - St. Paul, MN to St. Louis, MO (Fig. 5)

03/02/88 - St. Paul to Omaha, Neb. (Fig. 5)

Relocations were plotted on 1:2400 U.S. Geological Survey or
U.S. Army Corp of Engineers Navigation maps.

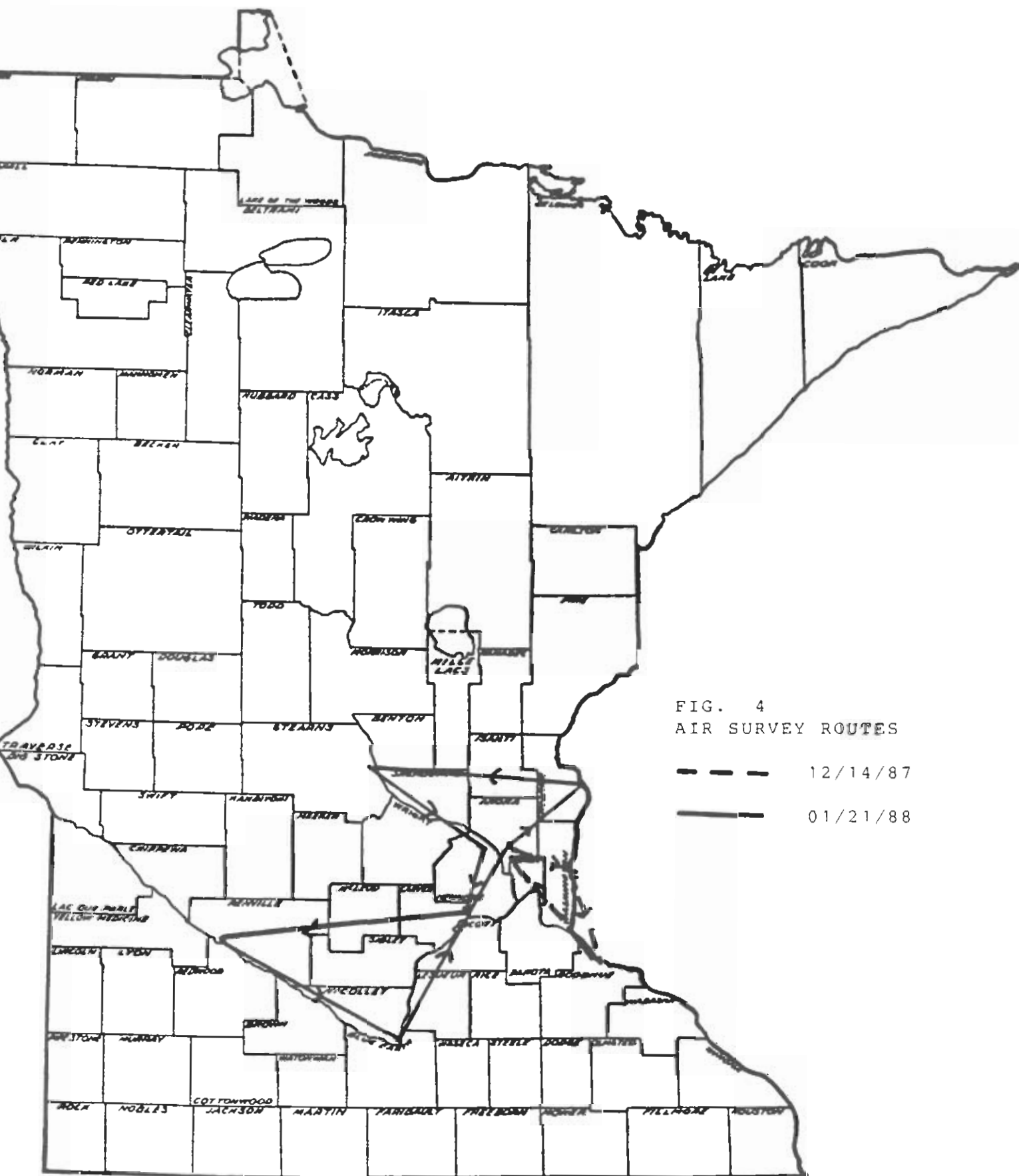


FIG. 4
AIR SURVEY ROUTES

--- 12/14/87
— 01/21/88

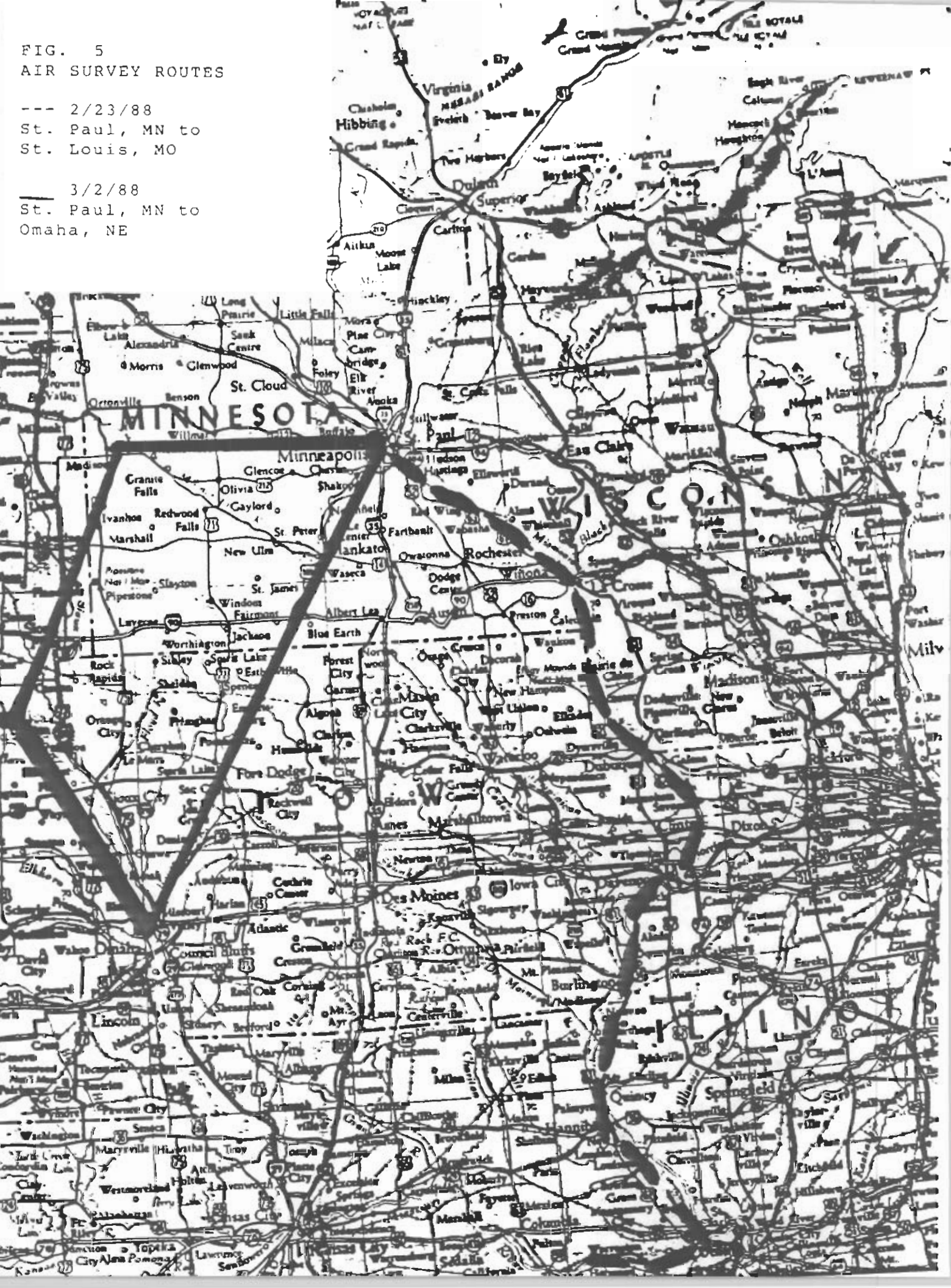
FIG. 5
AIR SURVEY ROUTES

--- 2/23/88

St. Paul, MN to
St. Louis, MO

— 3/2/88

St. Paul, MN to
Omaha, NE



RESULTS

Nineteen eagles were released during the course of this study; 6 adults, 11 juveniles and 2 birds in transitional plumage. There were 8 females, 5 males and 6 birds of undetermined sex (Table 1). Six birds (31.6%) had toe injury or loss, eight (42.1%) had wing fractures, three (15.8%) were unable to fly due to soft tissue damage or unknown causes, and two (10.5%) were starving. Information on each bird, its injury and follow-up information is detailed in Appendix I.

A total of 356 radio-relocations were obtained during the 3-year study, an average of 19.78 per bird (max. = 63, min. = 1, mean = 19.78, n=18). Over 545.3 hrs (290 in 87/88, 31.5 in 88/89, 223.8 in 89/90) were spent relocating released birds. Ground mileage totaled over 25674 km (5500 in 87/88, 2111.67 in 88/89, 18063 in 89/90).

Fifteen eagles (78.9%) were found 10 days after their release. Thirteen eagles (68.4%) were documented surviving over 6 weeks after their release. Relocations were obtained on one bird (N-415) 835 days after her release. The mean number of days that relocations were made after release was 134.2 (sd=203, n=15).

One female (N-415) nested for three years following her release in the winter of 1987. She nested on Pigs Eye Island, where she was released, with a male who may have nested the previous year. Fertile eggs were laid in 1988, but the nest was blown down in a wind storm about 10 days after incubation started. The pair successfully fledged one chick in both 1989 and

1990.

Mortality was recorded for 2 eagles released during this study. A bird released on 11/08/88 was found in a leg-hold trap 29 days later 129.6 km from the release site (Appendix I, case O-103). The bird was readmitted to TRC, however the extent and nature of the injuries necessitated euthanasia. Based on the length of the bird's survival and the fact that it otherwise was in good physical condition, we have listed this bird as "successfully released". The second known mortality was recorded in 1989/90 on a bird released at Saginaw, Mich. on 12/01/89 (Appendix I, case P-271). The circumstances of this bird's death are not clear but we cannot consider this bird successfully released.

Signals on 4 of the released eagles (21%) were lost within 10 days of their release. One bird (P-271 discussed above) was found dead, the fate of the other 3 is unknown. All 3 of these birds were wearing tail-mounted transmitters. We lost contact with none of the eagles that were fitted with back-pack style transmitters.

All of the relocations occurred along the Mississippi, St. Croix or associated waterways. Of the 15 birds that were tracked for more than 2 days, 12 stayed within 5 km of the release site for at least 3 days, while the other 3 were found within 10 km of their release site for at least 5 days.

The greatest distance we tracked the eagles from their release site varied considerably, ranging from 2 to 610 km ($\bar{x}=106.86$ km, $sd=193.9$ $n=14$). The birds released during the first year of the study travelled a mean distance of 167.7 km ($sd=266.65$ km, $n=7$) compared to the 30 km ($sd=19.06$, $n=7$) travelled by the birds released during the third year of the study. This difference is significant at the 0.10 level ($t=1.363$, $df=12$). Adults travelled an average of 111.4 km ($sd=217.489$, $n=5$), compared to the 89.18 km travelled by the immatures ($sd=176.2$, $n=11$). This difference is significant at the 0.01 level ($t=2.88$, $df=14$).

DISCUSSION

We have shown in this study that Bald Eagles can be treated for a variety of injuries, using proper veterinary and rehabilitation techniques, and will survive after being released into appropriate habitat. Furthermore, we have documented that rehabilitated Bald Eagles can reproduce, and will seemingly integrate back into the larger Bald Eagle population.

Injuries to the eagles we released in this study were representative of injuries seen in all the eagles admitted to TRC. The injuries were almost all severe and in 5 cases required amputation of a digit. That 4 of these eagles were known to have survived more than 9 weeks, and included the breeding female (N-

415) and the 2 birds who travelled the greatest distance (N-374 and N-369) indicates that both immature and adult Bald Eagles can adapt successfully to the loss of a digit. This further convinces us of the importance of immediate and proper treatment of leg-hold trap injuries in Bald Eagles. Seven of the released eagles were treated for fractures, and again, were able to resume normal functions in the wild.

Our findings that the eagles remained near the release site for the first few days after their release is similar to what Hamilton et al. (1988) found with Red-tailed Hawks in Louisiana. This tendency is important for rehabilitators to note when choosing release sites. An area chosen for release should be capable of satisfying habitat needs (particularly food and shelter) of the bird for at least 3 to 5 days after release. Choosing a release site where the bird may be in competition with others, is forced to fly a great distance, or which is marginal in its quality may put undue stress on the newly released bird.

The release sites for this study were chosen for their location within Bald Eagle wintering habitat (Milsap 1986, Dunstan 1987) and known use by Bald Eagles (Lane et al. 1986, Barton-Aschman 1987, Dunstan 1987).

Movements by released individuals were always along the river corridor and followed the seasonal patterns expected of wintering Bald Eagles, an indication that the birds had adjusted

to their release. The longest distances travelled by the birds in this study (610 km) was greater than that reported by either Duke et al. (1981) (364 km) or Servheen and English (1976) (332 km) and most likely reflects both the length of the Mississippi River wintering grounds and the amount of relocation effort expended in this study.

The survival, movements on the wintering grounds, and reproductive success of released rehabilitated Bald Eagles shows that the time and money spent does result in returning healthy, reproductively fit individuals back into the population. The impact of this upon the conservation of the population will depend on the numbers, ages, and possibly sex of those birds released. Further work is needed in looking at the success rate associated with particular injuries and diseases, especially lead poisonings and other toxic chemicals.

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